— Soil Fertility Note 14 —
Topsoil

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What is Topsoil?

Some people have the notion that topsoil is a marvelous, naturally deposited material that contains all the essential chemical, physical and biological components necessary for growing beautiful plants. Unfortunately, this is rarely the case. Topsoil often needs amending with lime, fertilizer or organic matter.

Use of topsoil is increasing in rapidly developing areas where the native soil is predominantly clay. Concerns have been raised about using clay-based soils for landscaping or lawns. Questions frequently asked include

1. When should topsoil be used?
2. What factors are important in selecting topsoil?
3. How can the quality of a topsoil be evaluated?
4. How does addition of topsoil affect drainage?

Deciding When to Use Topsoil

To use topsoil effectively, you must know two things: what kind of soil you are amending and what kind of result you hope to achieve. If your goal is to improve drainage, your strategy will be different than if your goal is to increase water-holding capacity. Applying appropriate amendments can help alleviate either problem.

In North Carolina, topsoil is often applied to "improve" existing clay-based soils. The topsoil chosen for this purpose is likely to be sandy. This scenario sets the stage for increased nutrient deficiencies, acidity problems and moisture stress. The very qualities of sandy soils that improve drainage can trigger these other problems. In such cases, the soil is better amended with a combination of topsoil and organic matter. Amendments that include compost, rotten sawdust, manure, peat moss or aged tree bark can improve drainage, soil porosity, nutrient retention and soil pH. They can also increase biological activity and promote root growth.

Your decision to apply topsoil will be based on the qualities of the topsoil and the qualities of the soil you want to amend. The following sections give background information on topsoil that you will need to consider.

Selecting Topsoil

Topsoil is commercially available either bagged or in bulk. Bagged topsoil usually is sold in 40- to 50-lb quantities and has been amended with lime, fertilizer and organic matter. Bulk topsoil generally is a native soil taken from the surface and sold in truckload lots. Unfortunately, bulk lots of North Carolina topsoil rarely meet the standards of a good topsoil.

The texture and fertility of bulk topsoils vary across geographic regions. In North Carolina, coastal plain soils are sandy whereas piedmont and mountain soils are mostly clayey. Although the topsoils from these two regions are vastly different, both can be made productive when properly amended with lime and fertilizers.

Sandy coastal plain soils have physical properties that make them easy to distribute, but they have low nutrient- and water-holding capacity. As a result, plants growing in these soils are more subject to nutrient deficiency and drought stress. Sandy soils generally require more frequent applications of lime and fertilizer, particularly nitrogen, potassium and sulfur. Addition of organic matter increases the water and nutrient retention of these soils.

In contrast, clay soils aggregate and are hard to distribute. However, they hold water and nutrients quite well. As a result, lime and fertilizer applications are needed less frequently than on sandy soils.

Evaluating Topsoil Quality

A soil test is the most reliable way to determine the quality of topsoil. Typical test results from a bulk soil and a bagged soil are given in **Table 1**. Most native bulk soils tested have low pH and nutrient content, both of which can be corrected with appropriate amendments. The addition of amendments, such as lime and fertilizer, also improves granulation of soil particles. Keep in mind, however, that clays remain clayey and sands remain sandy even after amendments are applied. You can modify the chemistry of soils, but their basic structure remains the same.

Table 2 presents some guidelines for evaluating topsoil quality. The parameters shown are within

ranges that should produce good plant growth. They apply to both bulk and bagged topsoils. Soil can be tested by sending samples to the NCDA&CS Agronomic Division Soil Testing Section at the address given on the front of this note.

Optimizing Water Movement

The mechanics of water movement through soil is often misunderstood. If a layer of sand is placed on top of a clay-based soil, water moves readily through the sand and is absorbed by the clay. In contrast, if sand is placed below the clay, water moves into the sandy layer only when the clay soil is totally saturated. Therefore, placing a layer of sand on a poorly drained clay-based soil has no effect on drainage of the clay.

Drainage of soils can be improved with any treatment that enhances granulation or aggregation of soil particles. Such treatments include lime, gypsum (calcium sulfate), organic matter, sand or a combination of all of the above. When adding topsoil or other treatment to an existing soil, mix the two thoroughly for best results.

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Table 1. Typical soil test results from bulk and bagged topsoil.

Topsoil	*HM%*	*BS%*	*pH*	*P-I*	*K-I*	*Ca%*	*Mg%*
bulk	0.3	69	5.2	009	026	45	10.0
bagged	0.7	78	5.8	166+	178	56	12.3

Table 2. Desired levels of soil nutrients.

pH	5.8 to 6.2
phosphorus (P-I)	index of 50
potassium (K-I)	index of 50
calcium (Ca%)	40–60% of CEC*
magnesium (Mg%)	8–10% of CEC*
base saturation (BS%)	60–80% of CEC*
manganese (Mn-I)	index >25
zinc (Zn-I)	index >25
copper (Cu-I)	index >25

* CEC = Cation Exchange Capacity = Ca + Mg + K + Acidity; CEC is a measure of the quantity of nutrients a soil will hold.
Ca% = [(Ca/CEC) × 100]
Mg% = [(Mg/CEC) × 100]

Questions or comments should be directed to the Soil Testing Section of the NCDA&CS Agronomic Division. Information on soil testing, nematode assay, plant/waste/solution analyses, and field services is also available from the division.